

THE MINERAL INDUSTRY OF TANZANIA

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In recent years, the mineral industry of Tanzania has produced copper, gold, silver, and rolled steel products, and such industrial minerals as calcite, diamond and other gemstones, gypsum, phosphate rock, salt, silica sand, and soda ash. The country has also produced coal, petroleum products, and such building materials as cement, gravel, limestone, and sand. Deposits of cobalt, copper, iron ore, natural gas, nickel, and titanium are also known to occur in Tanzania.

In 2003, Tanzania's gross domestic product (GDP) at purchasing power parity amounted to \$21.6 billion; per capita GDP was about \$600. The GDP grew by 7.1% in 2003, compared with 7.2% in 2002, and 6.2% in 2001. Manufacturing accounted for 9% of the GDP; construction, 5%; mining and quarrying, 3%; and electricity and water, 2% (International Monetary Fund, 2004a, p. 43; b, p. 206; 2004¹).

The value of output in the mining sector grew by about 17% in 2003 after rising by 15% in 2002. From 1999 to 2003, the value of output in the mining sector grew by an average of nearly 15% per year because of substantial increases in gold production (table 1). During the same period, the value of output in the construction and electricity and water sectors rose by an average of 10% and 4%, respectively (International Monetary Fund, 2004a, p. 43).

Trade

The value of Tanzania's mineral exports has risen substantially since 1999. Most of the increase was attributable to gold exports, which increased in value to \$504.1 million in 2003 from \$374.3 million in 2002 and \$39.8 million in 1999. From 1999 to 2003, gemstone exports increased in value to \$19.1 million from \$14 million, and diamond exports remained unchanged at \$26.4 million. The total value of mineral exports amounted to \$560.2 million in 2003. The share of total exports attributable to minerals rose to 48% in 2003 from 42.5% in 2002 and 13.5% in 1999; the share of total exports attributable to gold increased to nearly 44% from 6% (International Monetary Fund, 2004a, p. 68; Yona, 2004, p. 49).

The International Monetary Fund (2004a, p. 70-71) reported that imports of petroleum products rose in value to \$403.4 million in 2003 from \$194.8 million in 2002 and \$148.1 million in 1999. From 1999 to 2003, imports of fertilizers rose in value to \$28.5 million from \$10.8 million. Petroleum products accounted for nearly 19% of total imports, and fertilizers, 1%.

Commodity Review

Metals

Cobalt, Copper, and Nickel.—The Kahama Mining Corp. Ltd. (KMC) (100% owned by Barrick Gold Corp.) produced copper as a coproduct at the Bulyanhulu gold mine. Copper production increased to 3,303 metric tons (t) in 2003 from 2,700 t in 2002 (table 1). In 2003, Barrick conducted a drilling program at the Kabanga nickel sulfide deposit in northwestern Tanzania. In February, resources at Kabanga were reported to be 26.4 million metric tons (Mt) at a grade of 2.6% nickel; this estimate was made prior to the drilling program. Kabanga also had resources of cobalt and copper. National exports of copper amounted to 3,292 t at a value of \$7.33 million in 2003 (Kafumu, 2004; Yona, 2004, p. 48-49).

Goldstream Mining NL of Australia explored for cobalt, copper, and nickel at the Mibango and Wansisi Regional Projects near Lake Tanganyika and at the Luwumbu Project near Lake Malawi in 2003. According to preliminary data from the company's drilling program, nickel resources at Mibango were estimated to be 89.2 Mt at a grade of 1.08% nickel, 0.14% copper, 0.058% cobalt, and 0.45 gram per metric ton (g/t) platinum-group metals (PGM) and gold (Goldstream Mining NL, 2004).

Columbium (Niobium) and Tantalum.—Panda Hill Mines Ltd. explored for columbium (niobium) and tantalum at the Panda Hill deposit in the Mbeya Region. Resources at Panda Hill were estimated to be 480 Mt at a grade of 0.33% Nb₂O₅ (Ministry of Energy and Minerals, 1998, p. 83; Yona, 2003).

Gold.—In 2003, Tanzania's gold production increased to 48,018 kilograms (kg) from 43,320 kg in 2002 and 30,088 kg in 2001. Tanzania became the third-leading gold producer in Africa in 2003. The Buhemba, Bulyanhulu, Geita, Golden Pride, and North Mara mines had the capacity to produce about 50,200 kilograms per year (kg/yr) of gold. Tanzania's resources amounted to more than 1,400 t of contained gold, of which about 770 t were reserves (tables 1, 2, and 3).

In 2003, the Geita open pit gold mine produced 20,561 kg of gold from 5.7 Mt of ore compared with 18,010 kg of gold from 4.98 Mt of ore in 2002. Geita Gold Mining Ltd., which was owned by AngloGold Ltd. (50%) and Ashanti Goldfields Co. Ltd. (50%), started production in 2000. The gold recovery rate remained unchanged at 92% in 2003; cash costs rose to \$170 per troy ounce of gold from \$163 per troy ounce of gold in 2002 (Ashanti Goldfields Co. Ltd., 2004, p. 13).

¹References that include a section mark (§) are found in the Internet References Cited section.

Higher production at Geita was attributable to an increase in the ore treatment capacity to 5.6 million metric tons per year (Mt/yr). The plant expansion was completed during the first quarter of 2003. Gold production was expected to increase to nearly 21,500 kg in 2004 at a cash cost of \$199 per troy ounce of gold (Ashanti Goldfields Co. Ltd., 2004, p. 10).

KMC (100% owned by Barrick) operated the Bulyanhulu underground gold mine. In 2003, the Bulyanhulu Mine produced 9,753 kg of gold from 980,000 t of ore compared with 11,083 kg of gold from 1.08 Mt of ore in 2002. Recovery rates rose to 88% from 86%. Cash costs were \$246 per troy ounce of gold in 2003 compared with \$198 per troy ounce of gold in 2002. Production fell partly because higher mining dilution resulted in lower processed ore grades (Barrick Gold Corp., 2004, p. 18-19, 36-37). The majority of gold was recovered from copper concentrates; the remainder was from gold doré.

In 2004, Barrick planned to increase gold production to between 11,200 and 11,400 kg. The increase would be the result of higher grades mined and increased productivity. Barrick planned to raise production to between 13,400 and 17,700 kg/yr at an average cash cost of \$151 per troy ounce of gold over the expected 21-year life of the mine (Tassell, 2003a; Barrick Gold Corp., 2004, p. 37).

In October 2003, Barrick and Explorations Minières du Nord Ltée (MDN) of Canada completed a feasibility study for the Tulawaka project; the companies signed a development agreement with the Government in December. The new Tulawaka open pit mine was expected to produce from 3,100 to 3,300 kg/yr of gold starting in early 2005. The processing plant would treat about 1,000 metric tons per day of ore. Capital costs were expected to be \$49 million, and average cash costs, \$170 to \$180 per troy ounce of gold. The life of the mine was likely to be 4 years; reserves were estimated to be 1.42 Mt at a grade of 11.54 g/t gold (Explorations Minières du Nord Ltée, 2003; Barrick Gold Corp., 2004, p. 17; Tassell, 2004a).

Barrick planned additional exploration near Bulyanhulu in 2004. The company also held the Golden Ridge and Chocolate Reef properties, which had contained gold resources of 68 t and 59 t, respectively (table 3). Exploration at these properties was on hold as Barrick focused on developing the Tulawaka Mine.

Resolute Mining Ltd. of Australia owned the Golden Pride open pit mine. In 2003, the Golden Pride Mine produced 5,188 kg of gold from 2.49 Mt of ore compared with 4,625 kg of gold from 2 Mt of ore in 2002. Gold recovery rates exceeded 90% throughout the year. Higher production was attributable to an upgrade in the ore treatment capacity of Golden Pride that was completed in October 2002 (Resolute Mining Ltd., 2002; 2003a, b; 2004).

From 2004 to 2008, Resolute planned to produce nearly 5,000 kg/yr of gold at a cash cost of \$220 per troy ounce of gold. The company indicated that it expected to have a stockpile of 5 Mt of low-grade ore by 2009. Depending upon the price of gold, production from the stockpile could maintain milling operations for up to 2 years following the cessation of mining in 2008. Resolute also engaged in exploration work at Golden Pride and held 15 additional concessions within 60 kilometers (km) of the mine (Tassell, 2004b).

East African Gold Mines Ltd. (EAGM) started production at the North Mara open pit gold mine during the third quarter of 2002. The North Mara project encompassed the Gokona, the Nyabigena, and the Nyabirama pits. For the first 5 months of 2003, EAGM produced 2,481 kg of gold from 815,000 t of ore. In July, Placer Dome Gold Inc. of Canada purchased North Mara for \$255 million. During the last 5 months of 2003, Placer Dome produced 2,785 kg of gold from 869,000 t of ore. Cash costs were \$225 per troy ounce, and the recovery rate was nearly 94% (Lion Selection Group Ltd., 2003; Placer Dome Gold Inc., 2004, p. 38; Tassell, 2004a).

Production at North Mara was expected to be nearly 6,700 kg in 2004 at a cash cost of \$240 per troy ounce of gold. Placer Dome was expanding the ore-treatment capacity of its mill to 2.8 Mt/yr from 2 Mt/yr; gold production would rise to between 8,700 and 9,300 kg/yr. The upgrade was expected to be completed during the fourth quarter of 2004 at a cost of \$25 million (Placer Dome Gold Inc., 2004, p. 38; Tassell, 2004a).

EAGM and Placer Dome conducted exploratory drilling at North Mara in 2003. At the end of 2003, reserves at North Mara amounted to 34 Mt at a grade of 3.5 g/t gold; contained gold increased to nearly 120 t from about 90 t in 2002. Resources amounted to 48.5 Mt at a grade of 3 g/t gold (Lion Selection Group Ltd., 2003; Placer Dome Gold Inc., 2004, p. 22, 24, 35).

In February 2003, the state-owned company Meremeta Ltd. started production at the open-pit Buhemba Mine near Musoma. The company's monthly production amounted to between 240 and 250 kg of gold from nearly 100,000 t of ore; production of ore was expected to rise to 110,000 metric tons per month by early 2005. The expected life of the mine was 8 years. Meremeta also held the Kilamongo and Mwizi deposits south of Buhemba and the Nyasanero deposit. The Buhemba Mine was developed at a cost of \$65 million; Meremeta planned additional expenditures for exploratory drilling at Kilamongo and Mwizi (Kafumu, 2004; Tassell, 2004b).

Spinifex Gold Ltd. of Australia had a joint-venture agreement with Resolute for the Nyakafuru project; Nyakafuru had resources of about 3.6 Mt at a grade of 6.3 g/t gold (23 t of contained gold). Resolute explored at Nyakafuru in 2003, and Spinifex explored at the Buckreef/Rwamagaza and Kitongo projects, which had resources of 22 t and 17 t of contained gold, respectively. In 2003, Spinifex merged with Gallery Gold Ltd. of Australia. Gallery planned to spend \$2 million on exploration at Buckreef/Rwamagaza in 2004; the company was considering the development of a mine that could produce 5,000 kg/yr of gold (table 3; Resolute Mining Ltd., 2004; Tassell, 2004a).

In 2003, African Eagle Resources plc of the United Kingdom carried out drilling at Miyabi. The company planned additional exploration at Miyabi and Msasa in 2004 and was negotiating a joint venture at its Kakumba property. African Eagle relinquished its options over three licenses in 2003 (African Eagle Resources plc, 2004, p. 4).

Lakota Resources Inc. of Canada signed an option agreement with Gold Fields Ltd. for the Tembo project (the Bemuda, Ikina Reefs, and Tannor properties) near the Bulyanhulu Mine. Other properties held by Lakota included Shirera/Wandu and Siaga Hill.

Sub-Sahara Resources NL had a joint-venture agreement with Resolute for the Nyakafuru project, where Resolute explored for gold. In 2003, Sub-Sahara explored at the Nyanzaga project; the company expected to conclude negotiations on a joint-venture agreement in March 2004. Sub-Sahara had a joint-venture agreement with Minex Mining Ltd. for the Mabale Hills project. Other

projects held by Sub-Sahara included Jubilee Reef, Kasamwa, Musoma-Mara, and Nyamirembe; the company sought joint-venture partners for these projects. Sub-Sahara sold its interest in the Ikina Reefs property to Lakota in March 2003 (Sub-Sahara Resources NL, 2003, p. 1-3).

Tan Range Exploration Corp. of Canada signed a royalty agreement with Ashanti for the Kigosi property in 2003. Other properties held by Tan Range included the Luhala and Lunguya; the company held 69 properties in Tanzania (Tassell, 2004a). The company had royalty agreements with Ashanti, Barrick, and MDN for 29 of its properties at the end of 2003.

Randgold Resources Ltd. explored for gold at its Nyabigena South property, which was located near the North Mara Mine. In 2003, Randgold signed a joint-venture agreement with Goldstream NL for the Nyati license. The company held a total of 13 exploration licenses in Tanzania, of which 11 were in the Musoma Mara region (Randgold Resources Ltd., 2004, p. 39).

Iron and Steel.—National production of rolled steel increased to 38,747 t in 2003 from 25,418 t in 2002 and 8,982 t in 1999. MM Integrated Steel Mills Ltd. remelted scrap steel for use in its rolling mill; the company produced steel bars and pipes. Other rolling mills included Hans Industries Ltd., Sita Steel Rollings Ltd., Steel Masters Ltd., and Trishala Rolling Mills Ltd. Aluminum Africa Ltd. (ALAF) operated a plant for galvanizing sheet steel with a capacity of 40,000 metric tons per year (t/yr). In 2003, the company planned to increase production to between 32,000 and 33,000 t from 30,000 t in 2002 (Kenge, 2003a).

In 2002, the demand for scrap metal in Tanzania was about 40,000 t compared with a supply of 24,000 t; exports of scrap metal to Kenya and India contributed to the shortage. Domestic iron and steel producers were forced to import billet at a cost of \$240 per ton instead of using scrap that cost \$30 per ton. In 2003, the Government imposed a ban upon the export of scrap iron and steel. After the ban was implemented, average capacity utilization in the iron and steel industry rose from 60% to 85% (Kyaruzi, 2003).

The International Iron and Steel Institute (2004, p. 81, 85) estimated that Tanzania's imports of semimanufactured and finished steel products amounted to 134,000 t in 2002, compared with 121,000 t in 2001 and 63,000 t in 1997. From 1997 to 2002, Tanzania's apparent consumption of crude steel rose to 149,000 t from 71,000 t.

Platinum-Group Metals.—In 2003, Goldstream Mining NL explored for PGM at the Mibango and Wansisi projects near Lake Tanganyika and at the Luwumbu project near Lake Malawi. According to preliminary data from the company's drilling program, PGM resources at Mibango were estimated to be 9.3 Mt at a grade of 1.6 g/t PGM and gold, 0.85% nickel, 0.22% copper, and 0.065% cobalt. Goldstream had joint-venture agreements with Lonmin plc for the Mibango and Luwumbu projects that included additional exploration work and a feasibility study. Completion of the feasibility study at Mibango was unlikely before 2006. African Eagle explored for PGM at Zanzui in the Lake Victoria gold field (African Eagle Resources plc, 2004, p. 4; Goldstream Mining NL, 2004).

Silver.—Tanzania produced silver as a coproduct of gold mining and refining. Domestic output of silver increased to 7,986 kg in 2003 from 7,669 kg in 2002 (table 1). In 2003, national exports of silver amounted to 8,226 kg at a value of \$1.32 million. The Bulyanhulu Mine produced concentrates that contained copper, gold, and silver; the recovery rate for silver was 65%. Contained silver resources at Bulyanhulu were estimated to be 410 t, of which nearly 270 t was reserves (Barrick Gold Corp., 2004, p. 113; Yona, 2004, p. 48-49).

Industrial Minerals

Cement.—In 2003, Tanzania's production of cement increased to nearly 1.19 Mt from 1.03 Mt in 2002 and 778,000 t in 1998 because of demand from gold-mine development, infrastructure works, and large construction projects. Tanzania's three cement producers were Mbeya Cement Co. Ltd., Tanga Cement Co. Ltd., and Tanzanian Portland Cement Co. Ltd. (TPCC), which had a total clinker-grinding capacity of 1.25 Mt/yr and a total cement production capacity of 1.55 Mt/yr (tables 1, 2).

TPCC produced 500,000 t of cement in 2002. The company planned to increase its capacity to between 650,000 and 700,000 t/yr from 500,000 t/yr by September 2004. TPCC produced about 60% of its own clinker and imported most of the remainder; the expansion would enable the company to become self-sufficient in clinker. Mbeya Cement produced about 230,000 t/yr of cement. Tanga Cement began to substitute cashew nut shells for heavy fuel oil as an energy source; an expansion of this program was expected to be complete in late 2006. The use of cashew nut shells lowered energy costs (Kenge, 2003b; Thompson, 2003; World Business Council for Sustainable Development, 2003).

Tanzania's cement consumption increased to nearly 1.32 Mt in 2003 from 1.14 Mt in 2002 and 815,000 t in 1999. From 1999 to 2003, exports rose to 34,000 t from 29,000 t and imports rose to 166,000 t from 11,000 t.

Crushed Stone and Sand and Gravel.—The Tanga and Wazo Hill limestone deposits have been developed for use in the cement industry; Lindi is another substantial limestone deposit. The production of crushed limestone fell to about 1.1 Mt in 2003 from 2.86 Mt in 2002. The production of sand rose to nearly 2.04 Mt in 2003 from about 503,000 t in 2002. In 2003, the value of sand production was \$2.25 million, and limestone, \$2.07 million (Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004). Tanzania also produced aggregate and other construction materials; about 130,000 t/yr of aggregate was used as backfill in the Bulyanhulu underground mine.

Diamond.—In 2003, national diamond production amounted to 236,582 carats compared with 239,761 carats in 2002 and 97,830 carats in 1998. Diamond exports were 232,273 carats at a value of \$26.4 million in 2003. The Williamson Mine, which was operated by DeBeers Group, accounted for a majority of Tanzania's diamond production (Yona, 2004, p. 48-49).

Diamond recovery at the Williamson Mine rose to 166,263 carats in 2003 from 152,234 carats in 2002. Ore processed increased to 4.54 Mt in 2002 from nearly 3.33 Mt in 2002, but the grade of the ore fell to 3.7 carats per 100 t from 4.6 carats per 100 t. The increase in the amount of ore processed was the result of a new plant commissioned in October 2002 to treat mine tailings. DeBeers

planned to produce from 300,000 to 400,000 carats per year during the remaining life of the mine, which was expected to be at least 10 to 12 years (Tassell, 2003b; DeBeers Group, 2004, p. 48). The entire output of the mine was exported to the United Kingdom.

In April 2004, El Hillal Minerals Ltd. of Tanzania planned to start pilot mining at Mwadui near the Williamson Mine; full production was expected to start in October. The new mine would be the second-leading diamond mine in Tanzania. El Hillal invested \$12 million in exploration and development of its mine; this figure was expected to rise to \$14 million by October 2004. The company planned to produce 18,000 to 24,000 carats per year (Anatory, 2003; Yona, 2004, p. 23).

About 3,000 artisanal miners were estimated to be working in the vicinity of the Williamson Mine. The miners worked alluvial deposits of diamond that resulted from the erosion of the local kimberlites.

Gemstones.—In 2003, the total production of gemstones rose to 1,530,000 kg from 196,000 kg in 2002. The value of gemstone production, however, fell to about \$19.1 million in 2003 from \$19.8 million in 2002. A sharp increase in the output of such low-value gemstones as feldspar, moonstone, and quartz was more than offset by decreased production of high-value tanzanite (Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004).

Merelani, which is located near Arusha, was the world's only source of tanzanite. Officially reported production of tanzanite fell to 4,490 kg in 2003 from 6,461 kg in 2002. The value of tanzanite produced in 2003 amounted to \$13.14 million. From 2001 to 2003, tanzanite accounted for 80% of the value of domestic gemstone production. The decrease in output in 2003 may have been attributable to falling tanzanite prices in 2002 or increasingly difficult mining conditions (S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002; Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004).

In blocks B and D of the Merelani deposit, as many as 10,000 miners working in small-scale mines accounted for most of the country's tanzanite production. Mineshafts were getting deeper in block D; the increasing difficulty in reaching the deposits and removing tailings led to lower production. In block B, tunnels from the different mining operations were becoming intertwined. Tanzanite Africa Ltd. (a subsidiary of IPP Ltd. of Tanzania) started mining tanzanite; in February 2003, the company announced plans to build the second largest mine at Merelani. Kilimanjaro Mines Ltd. mined tanzanite in block A (East African, 2003; Henricus, 2003; Jewellery News Asia, 2003).

African Gem Resources Ltd. (Afgem) of South Africa held the rights to mine for tanzanite in block C; the company started commercial-scale production during the first quarter of 2003. From April to September, Afgem produced 163 kg of rough tanzanite from 12,311 t of ore. The company cut high-quality tanzanite at its lapidaries in South Africa and Tanzania. Afgem had a grading and certification program for its tanzanite; each stone was sold with a certificate of origin and authenticity issued by the Tanzanite Foundation. Steps were being taken to include all tanzanite producers in Afgem's program (Scheepers and Scheepers, 2003).

In early 2003, the Government instituted new measures to regulate tanzanite mining that included the establishment of the Tanzanite Advisory Board, increased security at the mines, a system of identification for miners, and safety regulations. The Tanzanite Advisory Board would participate in formulating mining and safety regulations and assisting small-scale miners. The Government restricted access to blocks A, B, and D of the Merelani mining area and planned a new system of formal employment at the mines. These measures were taken to ensure Tanzania's compliance with the Tucson Tanzanite Protocol that was established in February 2002. The increased emphasis on mine safety followed a fatal accident in June 2002 that temporarily halted tanzanite production (Henricus, 2003; Jewellery News Asia, 2003).

The Tucson Tanzanite Protocol is an agreement between the Arusha Regional Miners Association, the Government of Tanzania, the Tanzania Mineral Dealers Association, the Tanzanian Chamber of Mines, and gemstone and jewelry trade associations from India and the United States to certify that tanzanite bought, cut, polished, set, sold, or otherwise traded comes from legitimate sources. Under the agreement, the interested parties commit to strengthen and maintain a system of control, law enforcement, and oversight for the movement of tanzanite from the mines to the point of initial export (American Gem Trade Association, 2002).

More than 98% of the gemstones exported from Tanzania were shipped in rough form to foreign cutting and polishing centers. India received more than 50% of the exports of rough tanzanite, most of which was smuggled through Kenya and other neighboring countries. The Government announced that it would ban exports of rough tanzanite starting in July 2003, but it delayed implementation of the ban until the end of 2005 (Kondo, 2003b; Kafumu, 2004).

In late 2003, the Government announced plans to set up an export-processing zone in Arusha that would be dedicated to cutting, polishing, and marketing tanzanite. The Government planned to facilitate the development of tanzanite lapidaries by funding the training of cutters, creating special taxation centers for tanzanite dealers, and streamlining the process of obtaining tanzanite mining and trading licenses. The Tanzanian Mining and Trading Act of 2003 was under consideration; this bill would establish a Government agency to monitor the mining, cutting, polishing, and export of all Tanzanian gemstones. Tanzanite Africa and El Hillal planned to establish tanzanite cutting and polishing operations in 2004 (Africa Mining Intelligence, 2003; Kondo, 2003b).

Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was mined near Merelani and Mtwara. Tanzania's production of tsavorite nearly ceased in late 2003. Rhodolite garnet was mined along the Lelatema Fault, and red garnet was found at Mwazyee and Ng'ongo in the Sumbawanga District. In 2003, garnet production was 5,911 kg at a value of \$480,000 compared with 19,508 kg at a value of \$1.01 million in 2001 (GZ Journal, 2003; S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002; Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004).

In recent years, ruby has been produced at Longido in the Monduli District, at Mahenge in the Ulanga District, and in the Morogoro and Tunduru Districts. Seab Gems Ltd. of Tanzania closed its ruby mine at Mahenge in January 2003; remaining resources were reported to be subeconomic. In June 2002, the Naende ruby deposits were discovered near Chala in the Rukwa Region. The

discovery attracted artisanal miners from Rukwa and several other regions in Tanzania. By mid-2003, at least 10 mines owned by small-scale mining companies were operating near Chala. Mine depths were limited by a lack of modern equipment. Other factors that inhibited development of ruby resources in Rukwa included a lack of capital and investors to operate joint ventures with local miners, lapidary facilities, reliable markets, training, and transport. In 2003, national ruby production was 2,675 kg at a value of \$132,000 compared with 1,174 kg at a value of \$71,000 in 2001 (Kondo, 2003a; S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002; Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004).

Sapphire was produced in the Songea and Tunduru Districts in the Ruvuma Region and at Uмба River in the Tanga Region. New sapphire resources were discovered at the Naende Ruby Mines and at Mabwenkoswe and Tawete in the Sumbawanga District. In February 2003, IPP Ltd. of Tanzania announced plans to mine ruby and sapphire at Korogwe in the Tanga Region. In 2003, Tanzania's rough sapphire production was 1,338 kg at a value of \$60,000 compared with 3,576 kg at a value of \$490,000 in 2001. Cut sapphire production amounted to less than 1 kg (East African, 2003; Kondo, 2003a; S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002; Zacharia Makka, Commissioner for Minerals, Ministry of Energy and Minerals, written commun., October 28, 2004).

Aquamarine was mined at Kalunga in the Nkasi District; other deposits were found at Kamunyanzi, Lusaka, and Malombo in the Sumbawanga District. In 2003, aquamarine production fell to 278 kg from 600 kg (table 1) because of the depletion of resources at a deposit in the Songea District in 2002.

In August 2003, new alluvial and eluvial deposits of spinel were discovered in the Mahenge Region in south-central Tanzania; less than 30% of the rough spinel produced was facetable and the remainder was bead- or cabochon-quality (Quinn and Laurs, 2004).

Alexandrite and emerald were mined in the Manyara Region; emerald was also mined at Kalambazite, Lyamba La Mfipa, Muungano, Mwenzusi, Senga, and Waipanga in the Sumbawanga District. Small amounts of high-quality green tourmaline were produced in 2003; sources of tourmaline included the Naende ruby mines and Mwayze and Uzio in the Sumbawanga District. Other gemstones mined in the Rukwa Region included kyanite, opal, and zircon; deposits of agate, amethyst, moonstone, and topaz were reportedly discovered.

Lime.—Athi River Mining Ltd. of Kenya commissioned its lime plant at Tanga in December 2003. The plant had a capacity of 20,000 t/yr. Athi River planned to sell its output to gold mines in Tanzania and to double capacity at Tanga (Nation, 2004).

Mineral Fuels

Coal.—The Kiriwa coalfield produced a small amount of bituminous coal, most of which was consumed at a powerplant near the mine. Bituminous coal deposits in the Ruhuhu coalfield included the Ketewaka, the Mbalawala, the Mbuyura, and the Mchuchuma; other bituminous coalfields included the Gahula and the Njuga. In 2003, Tanzania's coal production fell to 54,610 t from 79,210 t in 2002 because of mechanical problems with mining equipment.

The state-owned National Development Corp. (NDC) formed a joint venture with Cinergy Global Power Inc., Grinaker-LTA, and Siemens Ltd. to develop the Mchuchuma deposit. Resources at Mchuchuma were estimated to be 536 Mt. In the first phase of the project, the NDC planned to build a surface mine with a capacity of 1.5 Mt/yr and a coal-fired powerplant with a capacity of 400 MW. In the second phase, coal production would rise to 3 Mt/yr, and in the third phase, to between 8 and 10 Mt/yr. The mine was expected to be commissioned in 2008; development of the mine could start in the third quarter of 2004. Costs for the project were estimated to be \$612 million (Spatial Development Initiatives Support Programme, 2003).

Natural Gas.—AES Corp. of the United States, PanOcean Energy Corp. Ltd., and Tanzania Electric Supply Company Ltd. (TANESCO) formed the Songas Ltd. consortium to develop the resources of natural gas at Songo Songo Island. The project would deliver natural gas from the Songo Songo field to the Ubungu powerplant in Dar es Salaam, which was operated by TANESCO, and to TPCC's cement plant at Wazo Hill. Kioo Glass and Kisarawe Brick Factory were also expected to consume gas from Songo Songo. Reserves at Songo Songo were estimated to be more than 17 billion cubic meters (PanOcean Energy Corp. Ltd., 2004, p. 43).

The Songo Songo project would involve installation of a gas processing plant on the island, construction of 258 kilometer (km) of pipeline to Dar es Salaam and Wazo Hill, and conversion of the 112-MW Ubungu plant from diesel to natural gas. The pipeline would have a capacity of nearly 1.1 billion cubic meters per year. Construction began on the natural gas gathering, production, and offshore pipeline in 2003; PanOcean expected the project to be completed in 2004 (PanOcean Energy Corp. Ltd., 2004, p. 43, 45).

In 2003, Artumas Group of Canada was negotiating with the Government to develop the Mnazi Bay gasfield in southeastern Tanzania. The Government was expected to sign a deal with Artumas in early 2004. Mnazi Bay had estimated resources of from 2.1 billion to 6.1 billion cubic meters. Gas from Mnazi Bay would be used in industry and power generation in the Lindi and Mtwara regions. The total cost of the project was estimated to be \$4.7 million (Spatial Development Initiatives Support Programme, 2003; Yona, 2003).

Petroleum.—Tanzania's only refinery was shut down because of its outdated technology and high transportation costs; the country depended upon imports for its petroleum requirements. In December 2003, Aminex plc of Ireland and its joint-venture partners Bounty Oil and Gas NL of Australia and Petrom SA of Romania were drilling the Nyuni-1 exploration well on its Nyuni offshore field concessions. The companies also planned to drill the Okuza-1 well in the vicinity of Okuza Island (African Energy, 2003). Royal Dutch/Shell Group held four offshore blocks to the west of Pemba and Zanzibar. The company planned to explore these properties in 2004. Antrim Energy Ltd. of Canada held the Pemba-Zanzibar offshore block. Maurel & Prom of France and Petrobras Group of Brazil were negotiating production-sharing agreements with the Government.

Infrastructure

The state-owned utility TANESCO had powerplants with a combined capacity of 794 MW in its grid network, of which 557 MW was hydroelectric and 237 MW was thermal. Hydroelectric power stations included Kidatu, with a capacity of 200 MW; Kihansi, 180 MW; Mtera, 80 MW; and others, 97 MW. The Ubungu thermal plant had a capacity of 112 MW; Tegeta, 100 MW; and others, 25 MW. Tegeta was owned and operated by Independent Power Tanzania Ltd. In addition to the plants in the grid network, 55 isolated mini-hydroelectric generators supplied 23 MW of capacity (Business Council for Sustainable Energy, 2003, p. 108; World Bank Group, 2004, p. 8).

The Geita Mine had its own isolated powerplant with a capacity of 39 MW; demand was 23 MW of capacity. At the Buhemba Mine, the isolated diesel powerplant had a capacity of 7 MW; demand was 4.5 MW of capacity. The Golden Pride and North Mara Mines had powerplants with capacities of 13 MW and 12 MW, respectively (Tassell, 2003a, 2004a-c).

In 2003, Tanzania's electricity production rose to 3,067 gigawatt-hours (GWh) from 2,801 GWh in 2002. Output from hydroelectric plants fell to 2,549 GWh in 2003 from 2,719 GWh in 2002 because of widespread droughts. Production from thermal plants rose to 518 GWh from 89 GWh because of greater capacity utilization. TANESCO's sales of electricity increased to 2,342 GWh in 2003 from 2,186 GWh in 2002; peak demand rose to 506 MW from 475 MW (World Bank Group, 2004, p. 5, 8, 10).

TANESCO estimated that the consumption of electricity would rise to 13,360 GWh in 2025 from 2,118 GWh in 1998. Peak demand would rise to 2,312 MW of capacity in 2025 from 727 MW in 2005 and 367 MW in 1998. Demand from gold mines was expected to grow to more than 100 MW of capacity. TANESCO's Power Sector Master Plan would add 1,440 MW of new capacity by 2021. In spite of plans to develop Tanzania's 4,700 MW of potential hydropower resources further, TANESCO planned to reduce the country's reliance on hydropower and imported petroleum. The company planned to build new gas-fired powerplants, substitute natural gas for diesel in other plants, build new coal-fired powerplants, and develop geothermal and other renewable energy sources (Business Council for Sustainable Energy, 2003, p. 108-109; Mwihava and others, 2003, p. 14).

About 37% of the urban population had access to electricity, and the rural population, less than 2%. Most rural energy requirements were supplied by charcoal. National wood fuel consumption was estimated to be 34 million cubic meters per year, which resulted in deforestation of about 900 square kilometers per year. To alleviate the environmental problems from deforestation, TANESCO promoted rural electrification (Business Council for Sustainable Energy, 2003, p. 111; Mwihava and others, 2003, p. 1, 9).

Geothermal areas in Tanzania include Lake Eyasi, Lake Manyara, Lake Natron, Mbeya, Musoma, Ngorongoro Crater, and Rufiji. Resources of geothermal energy at Rufiji were estimated to be more than 100 MW, and at Mbeya, more than 50 MW. The Government planned to produce 5% of Tanzania's electricity requirements by 2010; the cost of geothermal projects with a capacity of 55 MW was estimated to be about \$138 million (Mwihava and others, 2003, p. 8-9).

Most exploration for geothermal energy sources has been very preliminary because of abundant hydropower and plans to develop domestic coal and natural gas resources. The Government planned a 3-year exploration program for Arusha, Lake Eyasi, Lake Manyara, Lake Natron, and Ngorongoro Crater. The first phase would be a feasibility study that was expected to cost \$500,000. If the feasibility study were to yield favorable results, exploratory drilling would follow at a cost of \$2.5 million (Mwihava and others, 2003, p. 20-21).

Tanzania had about 85,000 km of roads, of which approximately 4,000 km was paved. Only 14% of the unpaved roads were in good condition; the Government planned to rehabilitate 4,500 km of roads by 2004. The rail network covered about 3,600 km. The country had 982 km of crude petroleum pipelines. Lake Nyasa, Lake Tanganyika, and Lake Victoria were the principal waterways. Ports and harbors were Bukoba, Dar es Salaam, Kigoma, Kilwa Masoko, Lindi, Mtwara, Mwanza, Pangani, Tanga, Wete, and Zanzibar.

Outlook

Tanzania's minerals industry, particularly gold mining, is likely to grow substantially in the near future. With increased production from the Bulyanhulu, Geita, and North Mara mines and the development of such projects as Tulawaka, Tanzania's gold production was expected to rise to about 59 t in 2005, and 61 t in 2007. Investments by Afgem and DeBeers are likely to lead to higher output of tanzanite and diamond; the outlook for these commodities also depends heavily upon world markets. The increases in diamond, gemstone, and gold production were likely to result in substantially higher mineral exports. The International Monetary Fund (2004b, p. 206) predicted that Tanzania's GDP would grow by 6.3% in 2004 and 6.5% in 2005. If similar rates of growth happen in the construction industry, the production of construction materials such as brick clay, gypsum, limestone, and sand and gravel could increase substantially.

References Cited

- Africa Mining Intelligence, 2003, Tanzania—Arusha a "tanzanite" export zone: Africa Mining Intelligence, no. 73, November 19-December 2, p. 2.
African Eagle Resources plc, 2004, Annual report 2003: London, United Kingdom, African Eagle Resources plc, 24 p.
African Energy, 2003, Tanzania—Petrom farms into Nyuni as drilling progresses: African Energy, no. 69, December, p. 17.
American Gem Trade Association, 2002, Tucson tanzanite protocol—Restoring confidence in tanzanite: Prism, Spring, p. 1, 8.
Anatory, Mujini, 2003, Locals to mine diamonds: Business Times [Dar es Salaam, Tanzania], September 26, 1 p.
Ashanti Goldfields Co. Ltd., 2004, Annual report 2003: Accra, Ghana, Ashanti Goldfields Co. Ltd., 57 p.
Barrick Gold Corp., 2004, Annual report 2003: Toronto, Ontario, Canada, Barrick Gold Corp., 120 p.

Business Council for Sustainable Energy, 2003, Market assessment report, *in* Eastern Africa Geothermal Market Acceleration Conference, Nairobi, Kenya, April 9-11, 2003, Proceedings: Arlington, Virginia, Business Council for Sustainable Energy, 138 p.

DeBeers Group, 2004, Annual review 2003: Johannesburg, South Africa, DeBeers Group, 64 p.

East African, 2003, Timely entry into mining: East African [Nairobi, Kenya], March 10, 2 p.

Explorations Minières du Nord Ltée, 2003, Update on the Tulawaka gold project: Montreal, Quebec, Canada, Explorations Minières du Nord Ltée press release, October 9, 2 p.

Goldstream Mining NL, 2004, Report for the quarter ended 31 December 2003: West Perth, Australia, Goldstream Mining NL, 10 p.

GZ Journal, 2003, Market report: GZ Journal, December, p. 82.

Henricus, Jennifer, 2003, Fresh supply likely to boost tanzanite sales in 2003: Jewellery News Asia, no. 221, January, p. 38, 40.

International Iron and Steel Institute, 2004, Steel statistical yearbook 2003: Brussels, Belgium, International Iron and Steel Institute, 111 p.

International Monetary Fund, 2004a, Tanzania—Selected issues and statistical appendix: Washington, DC, International Monetary Fund, Country Report No. 04/284, September 7, 78 p.

International Monetary Fund, 2004b, World economic outlook—The global demographic transition: Washington, DC, International Monetary Fund, September, 287 p.

Jewellery News Asia, 2003, Tanzania adopts measures to regulate tanzanite mining: Jewellery News Asia, no. 223, March, p. 118, 120, 124.

Kafumu, Peter, 2004, Tanzania—Six new mines in six years: Mining Journal, June 4, p. 18-20.

Kenge, Abduel, 2003a, 3,000 tonnes more for ALAF: Express [Dar es Salaam, Tanzania], May 29-June 4, 1 p.

Kenge, Abduel, 2003b, New production line likely to boost TPCC output: Express [Dar es Salaam, Tanzania], April 10-16, 1 p.

Kondo, Hamza, 2003a, Tanzanian ruby find brings hope: Colored Stone, v. 16, no. 3, May/June, p. 20-21.

Kondo, Hamza, 2003b, Tanzanians get rough: Colored Stone, v. 16, no. 6, November/December, p. 70-72.

Kyaruzi, Ibrahim, 2003, Industrialists laud scrap metal ban: Business Times [Dar es Salaam, Tanzania], June 13, 2 p.

Lion Selection Group Ltd., 2003, EAGM—Report to shareholders—North Mara gold project 30th June 2003: Melbourne, Australia, Lion Selection Group Ltd. press release, July 2, 2 p.

Ministry of Energy and Minerals, 1998, Tanzania—Opportunities for mineral resource development (3rd ed): Denver, Colorado, Brian W. Hester Inc., 108 p.

Mwihava, N.C.X., Mbise, H.A., Mnzava, L., and Kibakaya, G., 2003, Draft Country Study Research Report—Tanzania: Nairobi, Kenya, African Energy Policy Research Network, 31 p.

Nation, 2004, Cement firm's profits up by 69 per cent [sic]: Nation [Nairobi, Kenya], March 31, 2 p.

PanOcean Energy Corp. Ltd., 2004, 2003 annual report: St. Helier, United Kingdom, PanOcean Energy Corp. Ltd., 90 p.

Placer Dome Gold Inc., 2004, 2003 annual report: Vancouver, British Columbia, Canada, Placer Dome Gold Inc., 92 p.

Quinn, E.P., and Laurs, B.M., 2004, Pink to pink-orange spinel from Tanzania: Gems & Gemology, v. 40, no. 1, Spring, p. 71-72.

Randgold Resources Ltd., 2004, Annual report 2003: Jersey, Channel Islands, Randgold Resources Ltd., 96 p.

Resolute Mining Ltd., 2002, Report on activities for the quarter to 30 June 2002: Perth, Australia, Resolute Mining Ltd., 6 p.

Resolute Mining Ltd., 2003a, Report on activities for the quarter to 31 December 2002: Perth, Australia, Resolute Mining Ltd., 8 p.

Resolute Mining Ltd., 2003b, Report on activities for the quarter to 30 June 2003: Perth, Australia, Resolute Mining Ltd., 8 p.

Resolute Mining Ltd., 2004, Report on activities for the quarter to 31 December 2003: Perth, Australia, Resolute Mining Ltd., 8 p.

Scheepers, Reyno, and Scheepers, Claire, 2003, Update on tanzanite mining by AFGEM: Gems & Gemology, v. 39, no. 4, Winter, p. 337-338.

Spatial Development Initiatives Support Programme, 2003, Mtwara Development Corridor: Johannesburg, South Africa, Spatial Development Initiatives Support Programme, 4 p.

Sub-Sahara Resources NL, 2003, Quarterly activities report quarter ended 31 December 2003: Perth, Australia, Sub-Sahara Resources NL, 19 p.

Tassell, Arthur, 2003a, Tanzania's gold boom continues: African Mining, v. 8, no. 2, March-April, p. 44-48.

Tassell, Arthur, 2003b, Williamson—A bright future ahead?: African Mining, v. 8, no. 2, March-April, p. 36-43.

Tassell, Arthur, 2004a, A "mining miracle" in Tanzania: African Mining, v. 9, no. 2, March-April, p. 30-38.

Tassell, Arthur, 2004b, Buhemba quietly comes on stream: African Mining, v. 9, no. 2, March-April, p. 40-44.

Tassell, Arthur, 2004c, Golden Pride—The mine that started Tanzania's gold boom: African Mining, v. 9, no. 2, March-April, p. 46-51.

Thompson, Benjamin, 2003, Mbeya Cement accuses TRC of sabotage: Family Mirror [Dar es Salaam], Tanzania, December 2, 2 p.

World Bank Group, 2004, Tanzania—Emergency power supply project—Technical annex: Washington, DC, World Bank Group, Report T-7623-TA, May 14, 36 p.

World Business Council for Sustainable Development, 2003, Tanga goes nuts for sustainability: Geneva, Switzerland, World Business Council for Sustainable Development press release, December 15, 2 p.

Yona, D.N., 2003, Extraction industries—Oil, gas, and mining: Speech at Commonwealth-Tanzania Investment Conference, Dar es Salaam, Tanzania, May 29, 2003, 6 p.

Yona, D.N., 2004, Hotuba ya mheshimiwa Daniel N. Yona (MB), Waziri wa Nishati na Madini, akiwasilisha Katika Bunge makadirio ya matumizi ya fedha za Wizara ya Nishati na Madini kwa Mwaka 2004/05 [Speech by the Minister of Energy and Minerals, Daniel M. Yona, presenting to the National Assembly the estimate of expenditures of the Ministry of Energy and Minerals for the financial year 2004/05]: Dar es Salaam, Tanzania, Ministry of Energy and Minerals, 49 p.

Internet Reference Cited

International Monetary Fund, 2004 (September), Tanzania, World Economic Outlook Database, accessed December 3, 2004, via <http://www.imf.org/external/pubs/ft/weo/2004/02/data/index.htm>.

TABLE 1
TANZANIA: PRODUCTION OF MINERAL COMMODITIES ¹

(Metric tons unless otherwise specified)

Commodity ²	1999	2000	2001	2002	2003
Calcite ^e	40	40	40	40	40
Cement, hydraulic thousand tons	833	833	900	1,026	1,186
Coal, bituminous	75,044	79,184	77,789	79,210 ^r	54,610
Copper, contained in concentrates and doré	--	--	2,645	2,700	3,303
Diamond ³ carats	234,800	354,388	254,271	239,761 ^r	236,582
Gemstones, excluding diamond: ⁴					
Amethyst ^e kilograms	230	239 ⁵	277 ⁵	270 ^r	270
Aquamarine do.	200 ^e	205	454	600 ^{r, e}	278 ^p
Cordierite (Iolite) ^e do.	155	158 ⁵	312 ⁵	310 ^r	310
Garnet do.	14,100 ^e	14,940	19,508	13,000 ^{r, e}	5,911 ^p
Ruby do.	1,000 ^e	1,070	1,174	1,800 ^{r, e}	2,675 ^p
Sapphire do.	2,500 ^e	2,531	3,576	2,400 ^{r, e}	1,338 ^p
Tanzanite do.	5,216	5,516	5,473	6,461 ^r	4,490 ^p
Other ^e do.	71,800	126,141 ⁵	66,092 ⁵	171,000 ^r	1,520,000
Total do.	95,000	150,800	96,866	196,000 ^r	1,530,000
Gold do.	4,890	15,060	30,088	43,320 ^r	48,018
Gypsum and anhydrite, crude	21,195	60,000	72,000	73,000 ^r	23,176 ^p
Petroleum products	287,000	177,000	--	--	--
Phosphate minerals:					
Apatite	7,250 ^r	5,100 ^r	4,000 ^r	1,182 ^r	3,738 ^p
P ₂ O ₅ content	2,200 ^r	1,500 ^r	1,200 ^r	350 ^r	1,100
Salt, all types	35,893	70,000	65,000	71,200 ^r	58,978 ^p
Silver, contained in concentrates and doré kilograms	276	1,384	6,861	7,669 ^r	7,986
Steel, semimanufactured	8,982	11,182	16,340	25,418	38,747
Stone, sand, and gravel:					
Aggregates	NA	NA	NA	20,223	107,960 ^p
Dolomite	NA	NA	NA	NA	2,197 ^p
Limestone, crushed	1,241,155	1,500,000	2,269,359	2,856,711 ^r	1,099,672 ^p
Pozzolanic materials	2,274	57,014	41,468	52,000 ^r	24,460 ^p
Sand	NA	NA	NA	503,485	2,035,960 ^p

^eEstimated; estimated data are rounded to no more than three significant digits; may not add to totals shown. NA Not available. ^pPreliminary. ^rRevised. -- Zero.

¹Includes data available through October 28, 2004.

²In addition to the commodities listed, modest quantities of other crude construction materials, including red soil, are produced.

³Diamond figures are estimated to represent 85% gem-quality or semigem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production.

⁴Other precious and semiprecious stones produced include chrysoprase, emerald, kyanite, opal, peridot, and tourmaline.

⁵Reported figure.

TABLE 2
TANZANIA: STRUCTURE OF THE MINERALS INDUSTRY IN 2003

(Metric tons unless otherwise specified)

Commodity	Major operating companies	Location of main facilities	Annual capacity
Cement	Tanzania Portland Cement Co. Ltd. (HeidelbergCement, 41%)	Wazo Hill	500,000 cement; 800,000 clinker.
Do.	Tanga Cement Co. Ltd. (Holcim Ltd., 60%, and Saruji Corp., 40%)	Tanga	500,000 cement; 500,000 clinker.
Do.	Mbeya Cement Co. Ltd. (LaFarge Group, 58%).	Mbeya	250,000 cement; 250,000 clinker.
Coal, bituminous	Tanzania-China Kiwira Coal and Power (Hunan International Economic and Technical Cooperation Co., 62%, and Government, 38%)	Kiwira Mine	150,000 run of mine; 93,000 washed.
Copper, in concentrates	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%).	Bulyanhulu Mine near Kahama	20,000 concentrate; 3,600 copper.
Diamond	Williamson Diamonds Ltd. (DeBeers Group, 75%, and Government, 25%)	Mwadui Mine near Shinyanga	7,060,000 ore processing.
Do.	carats	do.	300,000 diamond.
Gold	Geita Gold Mining Ltd. (Anglogold Ltd., 50%, and Ashanti Goldfields Co. Ltd., 50%)	Geita Mine near Nyakabale	5,600,000 ore processing.
Do.	kilograms	do.	21,300 gold.
Do.	Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	1,095,000 ore processing.
Do.	kilograms	do.	13,400 gold.
Do.	Placer Dome Gold Inc.	North Mara Mine	2,000,000 ore processing.
Do.	kilograms	do.	7,000 gold.
Do.	Resolute Mining Ltd.	Golden Pride Mine near Isanga	2,600,000 ore processing.
Do.	kilograms	do.	5,200 gold.
Do.	Meremeta Ltd. (Government of Tanzania)	Buhemba Mine	1,200,000 ore processing.
Do.	kilograms	do.	3,300 gold.
Lime	Athi River Mining Ltd.	Tanga	20,000.
Petroleum products ¹	thousand 42-gallon barrels	Tanzanian & Italian Petroleum Refining Co. Ltd.	Dar es Salaam 5,440.
Phosphate rock	Minjingu Phosphate Co. Ltd.	Minjingu	30,000.
Steel	SITA Rollings Ltd.	Dar es Salaam	14,000 cold rolled.
Do.	Aluminum Africa Ltd.	do.	40,000 galvanized.
Tanzanite	African Gem Resources Ltd. ²	Merelani, Block C	120,000 ore processing.
Do.	kilograms	do.	1,600 tanzanite.
Do.	Tanzanite Africa Ltd. (IPP Media Ltd.)	Merelani	NA.
Do.	Kilimanjaro Mines Ltd.	Merelani, Block A	NA.

NA Not available.

¹Shut down in 2000.

²Formerly the graphite processing plant at Merelani operated by Phoenix Minerals Ltd.

TABLE 3
TANZANIA: GOLD RESOURCES AND RESERVES IN 2003

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
Reserves:				
Bulyanhulu ¹	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	27.9	12.2	339
Geita ²	Geita Gold Mining Ltd. (Anglogold Ltd., 50%, and Ashanti Goldfields, 50%)	70.6	3.8	271
North Mara ²	Placer Dome Gold Inc.	34.0	3.5	118
Golden Pride ²	Resolute Mining Ltd.	13.1	2.0	27
Tulawaka ¹	Barrick Gold Corp., 70%, and Exploration Minières du Nord, 30%	1.4	11.5	16
Total		147.0	5.2	771
Resources:				
Geita	Geita Gold Mines	167.4	3.5	579
Bulyanhulu	Kahama Mining Corp. Ltd.	36.4	12.4 ³	398
North Mara	Placer Dome Gold Inc.	48.5	3.0	143
Golden Ridge	Kahama Mining Corp. Ltd.	49.0	1.4	68
Chocolate Reef	do.	26.0	2.3	59
Golden Pride	Resolute Mining Ltd.	28.2	2.0	56
Tulawaka	Barrick Gold Corp., 70%, and Exploration Minières du Nord, 30%	2.6	9.3	24
Buhemba	Meremeta Ltd. (Government of Tanzania)	11.4	2.0	23
Nyakafuru	Gallery Gold Ltd.	3.6	6.3	23
Buckreef/Rwamagaza:				
Buckreef	do.	5.0	4.1	19
Bingwa and Tembo	do.	0.2	13.7	3
Kitongo:				
Main Zone	do.	10.5	1.4	15
Isegenghe Hill	do.	0.2	14.4	2
Kisunge Hill	Tan Range Exploration Corp.	9.4	1.0	9
Ikungu	Lakota Resources Inc.	2.5	2.3	6
Miyabi	African Eagle Resources plc	2.1	2.1	4
Total		403	3.5	1,430

¹Definitions of resources and reserves are based on National Instrument 43-101, as required by Canadian securities regulatory authorities.

²Definitions of resources and reserves are based on the Australasian Code for the Reporting of Identified Mineral Resources and Ore Reserves issued by the Joint Committee for the Australasian Institute of Geoscientists and the Australian Mining Industry Council.

³Note that, in most cases, the grade of resources is lower than the grade for reserves, but in this case, the grade of the less economic material is higher, leading to the paradox of a higher resource grade.

Sources:

Ashanti Goldfields Company Ltd., 2004, Annual report 2003: Accra, Ghana, Ashanti Goldfields Company Ltd., 57 p.

Barrick Gold Corp., 2004, Annual report 2003: Toronto, Ontario, Canada, Barrick Gold Corp., 120 p.

Explorations Minières du Nord Ltée, Annual information form relating to the year ended December 31, 2003: Montreal, Quebec, Canada, Explorations Minières du Nord Ltée, 27 p.

Mano River Resources Inc., 2004, Executive presentation—January 2004: Vancouver, British Columbia, Canada, Mano River Resources Inc., 60 p.

Placer Dome Gold Inc., 2004, 2003 annual report: Vancouver, British Columbia, Canada, Placer Dome Gold Inc., 92 p.

Resource Information Unit, 2001, Tanzania, in Register of African mining 2001/02: Subiaco, Australia, Resource Information Unit, p. 279-301.

Resource Information Unit, 2003, Tanzania, in Register of African mining 2003/04: Subiaco, Australia, Resource Information Unit, p. 203-216.

Tassell, Arthur, 2004a, A "mining miracle" in Tanzania: African Mining, v. 9, no. 2, March-April, p. 30-38.

Tassell, Arthur, 2004c, Golden Pride—The mine that started Tanzania's gold boom: African Mining, v. 9, no. 2, March-April, p. 46-51.